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ZHU, RICHARD Z	

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/753499
Filing Date: January 09, 2004
Appellant(s): Kia Silverbrook

Kia Silverbrook
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/29/2009 appealing from the Office action mailed 10/02/2009.

1. Real Party in Interest:

A statement identifying by name the real party in interest is contained in the brief.

2. Related Appeals and Interferences:

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or having a bearing on the board's decision in the pending appeal.

3. Status of Claims:

The statement of the status of claims contained in the brief is correct.

4. Status of Amendments After Final:

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

5. Summary of Claimed Subject Matter:

The summary of claimed subject matter contained in the brief appears to be correct.

6. Grounds of Rejection to be Reviewed on Appeal:

Claims 1, 2, 7, 11-12, and 17 are rejected under 35 USC 103 (a) as being unpatentable over ***Penn et al. (US 6169605 B1)*** in view of ***Jang et al (US 2002/0062909 A1)***.

Claims 3-6 and 8 are rejected under 35 USC 103 (a) as being unpatentable over the combined teachings of ***Penn et al. (US 6169605 B1)*** and ***Jang et al (US 2002/0062909 A1)*** in view of ***Klaus et al. (US 6056455 A)***.

Claims 18 - 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of ***Penn et al. (US 6169605 B1)*** and ***Jang et al (US 2002/0062909 A1)*** in view of ***O'Connor (U.S. 5,705,117 A)***.

Claim 22 are rejected under 35 USC 103 (a) as being unpatentable over the combined teachings of ***Penn et al. (US 6169605 B1)*** and ***Jang et al (US 2002/0062909 A1)*** in view of ***Miyake et al (US 6174039 B1)***.

7. Claims Appendix:

The copy of the appealed claims contained in the Appendix to the brief appears to be correct.

8. Evidence Relied Upon:

5,705,117	O'Connor	01-1998
6,056,455	Klaus et al.	05-2000
6,169,605	Penn et al.	01-2001
6,174,039	Miyake et al.	01-2001
2002/0062909	Jang et al.	05-2002

9. Grounds of Rejection:

The following ground(s) of rejection are applicable to the appealed claims:

- Claims 1, 2, 7, 11-12, and 17 are rejected under 35 USC 103 (a) as being unpatentable over ***Penn et al. (US 6169605 B1)*** in view of ***Jang et al (US 2002/0062909 A1)***.

Regarding Claim 1, ***Penn*** discloses a three dimensional object creation system for printing a three dimensional object comprised of layers stacked vertically with respect to each other **(Fig 1 and see Col 7, Rows 16-28, layer after layer of materials 25 and 35 are stacked vertically with respect to each other)**, the system comprising:

a series of printheads for printing the layers **(Col 16, Rows 35-45, Printhead 20 and Printhead 670 of integrated Printhead 650)**, the series of printheads simultaneously

printing at least two layers of different materials within the stack **(Fig 12, Col 16, Rows 35-45, Printhead 20 dispenses conductive object material 25 simultaneously with Printhead 670 dispenses insulative support material 35**); and

a semiconductor memory **(Col 6, Row 61-Col 7, Row 5, memory circuitries)**;

Penn does not disclose the system is configured to simultaneously printing at least two layers of different vertical positions within the stack and to reconfigure a printhead initially configured to print a layer at a first vertical position to print a layer at a second vertical position.

Jang discloses a three dimensional object creation system for printing a three dimensional object comprised of layers stacked vertically with respect to each other **(Fig 1 and see Abstract)** where the system is configured to printing at least two layers of different vertical positions within the stack **(Fig 1, at least five layers of different vertical positions within the stack)** and to reconfigure a printhead **(Fig 1, material dispensing device 38 with nozzle 40, see paragraph 63)** initially configured to print a layer at a first vertical position to print a layer at a second vertical position **(Paragraphs 114-115, using dispensing devices to dispense a first pore filling material as a first layer at a first vertical location and to dispense a second pore filling material as a second layer onto the first layer at a second vertical location, see Fig 1)**.

It would've been obvious to one of ordinary skill in the art at the time of the invention to modify the 3D manufacturing system of ***Penn*** to simultaneously print two layers of different vertical positions within the stack and to reconfigure a printhead initially

programmed to print at one vertical position to print at a second vertical position as taught by ***Jang*** whereas the motivation would've been to provide a 3D object manufacturing system in an office environment (***Jang*, Paragraph 18**) and that does not require heavy and expensive equipments (***Jang*, Paragraph 20**).

Regarding Claim 2, ***Penn*** discloses wherein data defining all of the layers is stored in the semiconductor memory (**Col 9, Rows 57-65**).

Regarding Claim 7, ***Penn*** discloses data links between printheads (**Col 9, Rows 57-65, in that the microprocessor dictates the configurations of printing to which each printhead must follow to execute printing. Therefore, it serves as datalink between printheads**).

Regarding Claim 11, ***Penn*** discloses wherein the printheads print two or more different materials in one layer (**Col 16, Rows 35-45, Printhead 20 dispenses conductive object material 25 while Printhead 670 dispenses insulative support material 35, See Fig 12**).

Regarding Claim 12, ***Penn*** discloses wherein the printheads are configured such that at least one of the layers may be printed with a first set of materials (**Col 16, Rows 46-56, where Printhead 20 filled in material 25 in one layer while Printhead 670 fill the rest of the layer in with material 35**) and at least one other of the layers may be printed with a second set of materials (**Col 16, Rows 49-56, layers, that is layers other than the current layer Printhead 20 had just dispensed material 25, between the conductive lines receive material 25 from Printhead 20 thereby connecting the conductive lines of different**

layers), and wherein the first and second sets are not the same (**Material 25 is conductive object material, Col 9, Rows 40-45. Material 35 in Col 16, Rows 22-23, Col 8, Rows 4-8**).

Jang further discloses each layer at different vertical positions are made of two sets of materials that are not the same (**Paragraph 115, the second pore filling material being different from the first pore filling material**).

Penn as modified by ***Jang*** would be able to print two layers of different materials at two different vertical positions.

Regarding Claim 17, ***Penn*** discloses a system including at least two printheads, a first one of printheads printing a first material and a second one of the printheads printing a second material, the first material being cured by a first method (**Col 10, Rows 24-27, Material 35 melts at a lower temperature than Material 25 therefore requiring a different curing method**) and the second material being cured by a second method and wherein the first and second methods are different (**Col 10, Rows 30-35, the first method of curing is by UV light and second method of curing is by fiber optic directed at the dispensing position whereas curing by UV light is different from curing by fiber optic**).

- Claims 3-6 and 8 are rejected under 35 USC 103 (a) as being unpatentable over the combined teachings of ***Penn et al. (US 6169605 B1)*** and ***Jang et al (US 2002/0062909 A1)*** in view of ***Klaus et al. (US 6056455 A)***.

Regarding Claim 3, the combined teachings do not disclose printheads with individual memories.

Klaus teaches wherein each printhead includes at least some of the semiconductor memory (**Fig 4, where it is shown that each printhead includes a plurality of registers whereas these registers are obviously made by semiconductor materials**).

Therefore, it would've been obvious to one ordinarily skilled in the art to modify the printheads of the combined teachings with individual semiconductor memories as taught by ***Klaus*** in order to provide printheads with higher nozzle firing rate (***Klaus*, Col 1, Rows 12-20 and Rows 49-57**).

Regarding Claim 4, *Penn* teaches that the printhead is configured to print a first layer (**Col 11, Rows 8-20**).

Therefore it would've been obvious to one ordinarily skilled in the art to modify the printhead of the combined teachings with memories from ***Klaus*** to print a first layer according to configuration lay out by CAD to enable printing at an efficient rate.

Regarding Claims 5 and 6, *Penn* discloses that after printing of one layer is finished, the data for the next layer is loaded (**Col 11, Rows 26-38**). Therefore, by modifying the memory of ***Klaus*** into printhead of ***Penn***, the next layer of data is being loaded into the memory of the printhead as soon as the printing of first layer is successfully concluded.

Regarding Claim 8, *Klaus* discloses Gbytes of semiconductor memory (**Col 1, Rows 22-31 and see Col 2, Rows 57-65, to solve the problem of handling extremely high data rate with limited bandwidth in a system of between 4 to 1200 material dispensing nozzles by providing printheads with memory and decoder to decode incoming sequence of encoded data. With data rates around 120 Mb/sec (15 MB/sec) to 480**

Mb/sec (60 MB/sec). The data that needed to be buffer before printing can start easily reaches the range of gigabytes).

While ***Klaus*** does not teach that semiconductor memory must be over 10 GB, it would motivate one ordinarily skilled in the art to specify a memory capacity in the gigabyte range to handle the immense amount data for a system with number of nozzles between 4 and 1200. Furthermore, using different size to fit a particular purpose is well known in the art. For example, wearing size 10 shoes for a size 10 feet, wearing size 5 shoes for a size 5 feet. Using different size of memory to fit a particular need is well known in the art. Therefore, it would have been obvious to use any size memory so long as the job is done --including using memory about 10GB.

Therefore, it would've been obvious to one ordinarily skilled in the art to configure the memory of the printheads to have a capacity in the range of 10 GB in order to enable the plurality of printheads to execute the enormous amount of print jobs.

- Claims 18 - 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined teaching of ***Penn et al. (US 6169605 B1)*** and ***Jang et al (US 2002/0062909 A1)*** in view of ***O'Connor (U.S. 5,705,117 A)***.

Regarding Claims 18-21, the combined teachings do not teach that a non-printed object can be inserted into the product.

In a method to produce components via stereolithography, ***O'Connor*** teaches that a non-photopolymer component or item can be inserted into the prototype product being manufactured. Examples of insert members include metal or ceramic members **(Col 2, Rows**

38 - 42). As in other stereolithography systems, there is a CAD design used to create the prototype **(Col 6, Rows 24 - 25)**. A microprocessor is programmed to translate the CAD data to create the appropriate STL files, from which the prototype will be manufactured, layer by layer **(Col 6, Rows 38 - 42)**. The prototype is partly built and then, the system is stopped, at which time the metal or ceramic insert is placed into the cavity **(Col 6, Rows 45 - 50)**. This reads on the Appellant's claims that the system include at least one printhead for printing material to create a printed product **(For example, using the printhead of Penn, Fig 12, printheads 20 and 670)**, and an object incorporation device that incorporates inorganic semiconductors into the product being printed whilst the at least printhead prints the product **(O'Connor, Col 5, Rows 45-60, inserting metallic or ceramic members into cavity)**; and wherein the system includes at least one object incorporation device that incorporates non-printed objects into the partially complete product, the non-printed objects not being printed by the system **(O'Connor, Col 6, Rows 38-56, microprocessor 30 programmed to perform the insertion)**; wherein an object incorporation device that inserts at least one non-printed object into at least one cavity created during the printing process, the object incorporation device incorporating the at least one non-printed object into the at least one cavity during the printing of the respective printed object **(O'Connor, Col 6, Rows 44-56, when a first part is build, supposedly using the printhead of Penn, the printhead is stopped so that the metallic or ceramic insert within appropriate cavity is performed)**; and wherein the system includes at least one printhead that prints electrical connections to at least one object incorporated in the products **(Fig 2, metals and ceramics are well known electric conducting materials)**.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the Appellant's invention to modify the system of the combined teachings to incorporate the object incorporation device of ***O'Connor*** by modifying microprocessor 30 to control the overall operations of printhead 25 and 670 for the purpose of inserting a ceramic or metal component into a designated cavity of the prototype, if necessary, depending on what type of prototype is being manufactured.

- Claim 22 are rejected under 35 USC 103 (a) as being unpatentable over the combined teachings of ***Penn et al. (US 6169605 B1)*** and ***Jang et al (US 2002/0062909 A1)*** in view of ***Miyake et al (US 6174039 B1)***.

Regarding Claim 22, the combined teachings do not teach wherein upon failure of printhead whilst printing its respective layer, each subsequent printhead is dynamically reconfigured to complete the printing of at least part of the layer preceding its respective layer.

Miyake teaches a print data creation system comprising a plurality of printheads (**Col 4, Rows 58-67, seven recording heads in total**) that prints objects layer by layer (**Col 7, Rows 46-55, dividing image data to be printed in two scans or two layers, the first layer being the first 50% of the original image data density from 0% to 50% and the second layer being the second 50% of the original image data density; whereas when two layers are superimposed, 100% of the original image data density is reproduced**), at least some of the layers being different materials (**Col 4, Rows 58-67, cyan, cyan-special, magenta, magenta-special, orange, yellow, and black**), and the system is configured to enable each printhead initially configured to print at least part of a respective layer of a respective

material to be dynamically reconfigured to print at least part of another layer of another material (**Abstract and see Col 7, Row 32 – Col 8, Row 40, image data to be supplied to abnormal recording element is moved to image data of other recording elements to complement the recording**), and if at least one printhead fails whilst printing its respective layer, each subsequent printhead is dynamically reconfigured to complete the printing of at least part of the layer preceding its respective layer (**Col 7, Row 59 – Col 8, Row 4, when a nozzle was detected to be abnormal, the part of the data of a first layer it was originally responsible for is transfer to the corresponding part of the data of a subsequent layer to be printed by a normal nozzle, see Col 8, Rows 1-5, "As the nozzle for printing superposed data is normal"**).

Miyake demonstrated that it is well known in the art of object data creation of printing layer by layer to dynamically reconfigure a first nozzle that prints a subsequent layer of material to complete the printing of at least part of the layer preceding it, said part originally being the responsibility of a currently abnormal nozzle.

Therefore, it would've been obvious to one of ordinary skill in the art at the time of the invention was made to apply the known technique and architecture of ***Miyake*** of printing image data layer by layer into the 3D object creation system of the combined teachings to print 3 dimensional materials layer by layer so that the printhead of the combined teachings can dynamically reconfigure a first nozzle to print a layer of material that was previously the responsibility of a second nozzle that is currently in an abnormal state whereas the motivation would've been to ensure data which may be printed abnormally or missed if no

measure is taken can be correctly printed in accordance with the data (***Miyake*, Col 8, Rows 1-5**).

10. Response to Arguments:

- **In response to** "Jang…does not teach or suggest or motivate a modification of Penn…This object of Jang et al. can be satisfactorily formed by the device of Penn et al. without any modifications" **on Page 10 and** "It is untenable to suggest that one of ordinary skill in the art, if presented only with a 3-D object made up...would firstly desire to have a device that could print two or more different vertical layers simultaneously, and secondly be able to obviously arrive from the device of Penn et al. a new device that could print two or more different vertical layers simultaneously...Accordingly, the person of ordinary skill in the art would not see any need to further modify the device of Penn et al." **on Page 11.**

The basis for analysis under obviousness consists of teaching, suggestion, and motivation to modify an existing base device in order to obtain improvement in its mode of operation. Here, improvement involves not just correcting a deficiency, it also involves improvement to provide added advantage on even a flawless base device.

Jang explicit suggests that the pore filling materials of each physical layer should be base upon the structural or physical requirements of the desired object being built (**Paragraph 109, "exhibit variations in composition based upon the structural or physical requirements of the desired object being built"**). Here, ***Jang*** <u>teaches</u> a desired structural or physical requirement could comprises variation in composition of material within a single layer or <u>multiple layers homogenous of materials lay one on top of another</u>

comprising at least two layers of two different vertical positions within a stack of layers as follow:

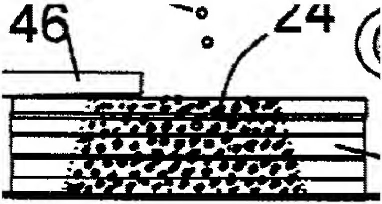
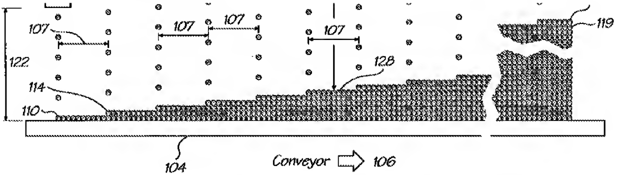


Fig 1 of ***Jang***

vs. Fig 1 of appellant's specification



That is, by offering one of ordinary skill in the art at the time of the invention the option of printing a 3D object by laying at least two layers of two different materials at two different vertical positions to obtain a desired structural or physical property that is in addition to the teachings of ***Penn***, ***Jang*** is substantially <u>suggesting</u> to one of ordinary skill that the base device of ***Penn*** can be improved upon to have more options in printing 3D objects. After all, modifying a device to offer a user more options are in itself improvements

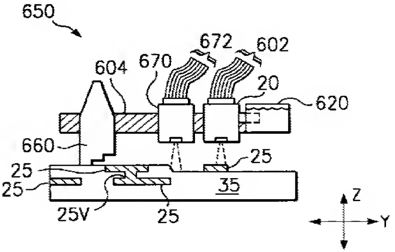
on a base device. The motivation is simply to make the apparatus of ***Penn*** more desirable for one of ordinary skill in the art.

Thus, one of ordinary skill in the art would obviously see the need to improve ***Penn*** in accordance to the teachings of ***Jang***.

- **In response to** "Jang et al. do not suggest that it is possible to simultaneously print at two different vertical positions" **on page 11 and** "therefore, it is clear that there is no teaching or suggestion from either of Jang et al. and Penn et al. to print two vertical layers in the stack simultaneously" **on page 12.**

It has been well established by the court that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See In re Keller, 642 F.2d 413,208 USPQ 871 (CCPA 1981); In re Merck & Co., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Applying a well known technique to a well known device has been shown to be obvious if the results of the combination are predictable to one of ordinary skill in the art. **(See Fig 12 of Penn show below)**

FIG. 12



Penn discloses at least two printheads 20 and 670, each printhead being responsible for simultaneously printing at least two different materials in a single vertical position within a stack. ***Jang*** also teaches an additional configuration in which multiple dispensing devices or printhead can be use instead of a single dispensing device (**Paragraph 63, "More than one dispensing device each with one or a multiplicity of nozzles may be used"**) to print at least two different materials in at least two layers of different vertical positions within the stack. Thus, by considering the background knowledge possessed by a person having ordinary skill in the art and the inferences and creative steps that a person of ordinary skill in the art would employ, the most obvious and straight forward modification to ***Penn*** would be to simply improve upon printheads 20 and 670 to simultaneously print at least two different materials in two layers of different vertical positions.

Here, the improvement is the predictable substitution of printing two layers of distinct materials in a single vertical position with printing two layers of distinct materials in two vertically stacked layers, which is obvious to one of ordinary skill in the art at the time of the invention because the combination is the predictable use of two known methods according to established properties.

Thus, it is immaterial that ***Jang*** does not teach simultaneously printing two layers at two vertical positions because the basis for simultaneous printing of two different materials already exists in the base device of ***Penn*** where it is the base device that is being improved upon to give an user the option of simultaneously printing two different materials at two different layers at different vertical positions; so as to obtain a desired physical properties of

a 3D object such as hardness, density, or coefficient of thermal expansion or uniform external appearances such as color patterns.

Thus, no impermissible hindsight was apply in reaching the conclusion of obviousness.

- **In response to** "Neither Penn et al. nor Jang et al. teach or suggest simultaneously printing at vertical positions y = 1 and 2, and then y = 3 and 4" **on page 12.**

First and foremost, the claim recites "the system is operable to reconfigure a printhead initially configured to print a layer at a first vertical position to print a layer at a second vertical position". No where in the claims are there requirements that can be construed to "simultaneously printing at vertical positions y = 1 and 2, and then y = 3 and 4".

Second, ***Jang*** explicitly suggest in the scenario where only one dispensing device is used (**Fig 1**), the apparatus is <u>operable to reconfigure a printhead</u> initially configured to print a layer at a first vertical position to print a layer at a second vertical position (**Paragraphs 114-115 in view of Fig 1**). Thus, if one of ordinary skill in the art so desires, ***Jang*** provides the user with a simplified apparatus to execute 3D object printing using one printhead that provides a lighter and less expensive alternative to ***Penn*** (***Jang***, **Paragraph 20**).

Third, even if the claim is amended to require such features, appellant cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. Here, the base device of ***Penn*** as modified by ***Jang*** does not stop at printing just one repetition of two different layers of materials at two different vertical positions y = 1 and y = 2 because one of ordinary skill in the art is not assume to be lacking in creativity or basic knowledge of how 3D objects are made. Rather, it is well within the

expected knowledge of one of ordinary skill in the art at the time of the invention that 3D objects are made of more than two layers of material and within the expected creativity of one of ordinary skill in the art to dynamically reconfigured the modified printheads to print at y =3 and y = 4 according to the principles of reconfiguring printheads to print at incrementing vertical positions already taught by ***Penn*** and ***Jang***; just as a computer that can calculate 1+1 to arrive at 2 is expected to calculate 2+2 to arrive at 4.

11. Related Proceeding(s) appendix:

No decision rendered by a court or the board is identified by the examiner in the related appeals and interferences section of this examiner's answer.

For the above reasons, the examiner sustains the rejections as set forth in the final rejection.

Respectfully submitted,

Conferee:

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Examiner, Art Unit 2625
02/08/2010

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